

IN THE CLAIMS:

1. (Currently Amended) A host coupled to a cluster fabric ~~including that is~~ coupled to one or more fabric-attached I/O controllers that may be allocated or assigned to different hosts, the host comprising:

a processor;

a memory coupled to the processor; and

an operating system provided with an I/O bus abstraction to report multiple paths to a target fabric-attached I/O controller that may be allocated or assigned to different hosts, the operating system to direct service requests between the host and the target fabric-attached I/O controller in response to the multiple paths.

2. (Original) The host as claimed in claim 1, wherein said operating system further comprises:

a kernel; and

a fabric bus driver to provide said I/O bus abstraction to the kernel for the cluster fabric to report the multiple paths to the target fabric-attached I/O controller.

3. (Original) The host as claimed in claim 2, wherein said fabric bus driver presents the cluster fabric to the kernel as a local I/O bus, and presents one or more target fabric-attached I/O controllers to the kernel as local I/O controllers.

4. (Original) The host as claimed in claim 2, further comprising a host-fabric adapter provided to interface the host to the cluster fabric.
5. (Original) The host as claimed in claim 4, further comprising a fabric adapter device driver provided to control operation of the host-fabric adapter.
6. (Original) The host as claimed in claim 5, wherein said fabric bus driver creates a separate device object for each port of the host-fabric adapter that can be used to communicate with the target fabric-attached I/O controller and establish the multiple paths to the target fabric-attached I/O controller.
7. (Original) The host as claimed in claim 5, wherein said multiple paths are utilized for load balancing I/O requests and/or for fault tolerance when one or more paths to the target fabric-attached I/O controller fail.
8. (Original) The host as claimed in claim 5, wherein said fabric bus driver creates a single device object for the target fabric-attached I/O controller even if multiple ports of the host-fabric adapter can be used to communicate with the target fabric-attached I/O controller.
9. (Currently Amended) An operating system for a host coupled to a cluster fabric that is coupled to including one or more fabric attached I/O controllers that may be allocated or assigned to different hosts, comprising:

a kernel;

an I/O manager operatively coupled to the kernel;

one or more I/O controller drivers operatively coupled to the kernel, each I/O controller driver specific for a specific type of I/O controller that may be allocated or assigned to different hosts; and

a fabric bus driver operatively coupled to the I/O manager to provide an I/O bus abstraction to the I/O manager to report multiple paths to a target fabric-attached I/O controller that may be allocated or assigned to different hosts, the operating system to direct service requests between the host and the target fabric-attached I/O controller in response to the multiple paths.

10. (Original) The operating system as claimed in claim 9, wherein said fabric bus driver appears to the I/O manager as a local I/O bus driver.

11. (Original) The operating system as claimed in claim 9, wherein said fabric driver presents the cluster fabric to the I/O manager as a local I/O bus and presents the one or more fabric attached I/O controllers as local I/O controllers connected to the local I/O bus.

12. (Original) The operating system as claimed in claim 9, further comprising one or more local I/O bus drivers operatively coupled to the I/O manager.

13. (Original) The operating system as claimed in claim 12, wherein said local I/O bus drivers and said fabric bus driver communicate with the I/O manager using a common set of procedures.

14. (Currently Amended) A cluster comprising:

a cluster fabric;

a host ~~including an operating system~~ coupled to the cluster fabric, the host including an operating system;

an I/O controller attached to the cluster fabric, wherein the I/O controller may be allocated or assigned to different hosts; and

a fabric manager coupled to the cluster fabric, ~~for assigning~~ to assign I/O controllers in the cluster fabric to at least said host and sending messages to said host indicating that the I/O controller has been assigned;

wherein said operating system including a fabric bus driver provided to report multiple paths to a target fabric-attached I/O controller that may be allocated or assigned to different hosts, the operating system to direct service requests between the host and the target fabric-attached I/O controller in response to the multiple paths.

15. (Original) The cluster as claimed in claim 14, wherein said operating system further comprises a kernel, and said fabric bus driver provided said I/O bus abstraction to the kernel for the cluster fabric to report the multiple paths to the target fabric-attached I/O controller.

16. (Original) The cluster as claimed in claim 14, further comprising a host-fabric adapter provided to interface the host to the cluster fabric, and a fabric adapter device driver provided to control operation of the host-fabric adapter.
17. (Original) The cluster as claimed in claim 15, wherein said fabric bus driver creates a separate device object for each port of the host-fabric adapter that can be used to communicate with the target fabric-attached I/O controller and establish the multiple paths to the target fabric-attached I/O controller.
18. (Original) The cluster as claimed in claim 17, wherein said multiple paths are utilized for loading balancing I/O requests and/or for fault tolerance when one or more paths to the target fabric-attached I/O controller fail.
19. (Original) The cluster as claimed in claim 15, wherein said fabric bus driver creates a single device object for the target fabric-attached I/O controller even if multiple ports of the host-fabric adapter can be used to communicate with the target fabric-attached I/O controller.
20. (Previously Amended) The cluster as claimed in claim 14, wherein said fabric manager comprises:
- fabric services to detect the connection or presence of the target fabric-attached I/O controller and to assign a network address to the target fabric-attached I/O controller; and

an I/O controller manager coupled to the fabric services to assign the target fabric-attached I/O controller to said host and to send messages to said host indicating that the target fabric-attached I/O controller has been assigned.

21. (Currently Amended) A computer usable medium having computer readable program code embodied therein for use in a host system to report multiple paths via a cluster fabric to a target fabric-attached I/O controller that may be allocated or assigned to different hosts ~~via a cluster fabric~~, said computer readable program code when executed, cause a computer to:

create and report multiple paths from a host via the cluster fabric to a target fabric-attached I/O controller that may be allocated or assigned to different hosts ~~via the cluster fabric~~;

enable reporting the multiple paths to the target fabric-attached I/O controller;
and

direct service requests between the host and the target fabric-attached I/O controller in response to the multiple paths.

22. (Currently Amended) A method of initializing a host to report multiple paths to a target agent via a cluster fabric, comprising:

loading an operating system kernel into a memory;
loading an I/O manager into the memory;
loading a local I/O bus driver and a fabric bus driver providing a local I/O bus abstraction for the cluster fabric into the memory;

enabling the local I/O bus driver to identify any local I/O controllers connected to a corresponding local I/O bus;

enabling the fabric bus driver to identify any fabric-attached I/O controllers assigned to the host, and report the identified local I/O controllers connected to the local I/O bus and the identified fabric-attached I/O controllers to the I/O manager, wherein the fabric-attached I/O controllers may be allocated or assigned to different hosts;

loading an I/O controller driver into the memory for each reported I/O controller;

enabling the fabric bus driver to create and report multiple paths via the cluster fabric to a target fabric-attached I/O controller that may be allocated or assigned to different hosts ~~via the cluster fabric~~; and

directing service requests between the host and the target fabric-attached I/O controller in response to the multiple paths.

23. (Original) The method as claimed in claim 22, wherein said identified local I/O controllers connected to the local I/O bus and said identified fabric-attached I/O controllers to the I/O manager are reported using a common set of procedures or commands.

24. (Currently Amended) A method of initializing a host to report multiple paths to a target agent via a cluster fabric, comprising:

loading an operating system kernel into a memory;

loading an I/O manager into the memory; and

loading a local I/O bus driver and a fabric bus driver providing a local I/O bus abstraction for the cluster fabric into the memory;

enabling the local I/O bus driver to identify any local I/O controllers connected to a corresponding local I/O bus;

enabling the fabric bus driver to identify any fabric-attached I/O controllers assigned to the host, identifies all paths to a target fabric-attached I/O controller that may be allocated or assigned to different hosts, create one instance of an I/O controller driver stack for each path to the target fabric-attached I/O controller, and report all multiple paths via the cluster fabric to a target fabric-attached I/O controller that may be allocated or assigned to different hosts~~via the cluster fabric~~; and

directing service requests between the host and the target fabric-attached I/O controller in response to the multiple paths.

25. (Currently Amended) A method of initializing a host to report multiple paths via a cluster fabric to a target fabric-attached I/O device that may be allocated or assigned to different hosts~~via a cluster fabric~~, comprising:

loading an operating system (OS) into a memory;

identifying all fabric-attached I/O devices assigned to the host, wherein the fabric-attached I/O devices may be allocated or assigned to different hosts;

reporting the identified fabric-attached I/O controllers; and

creating and reporting multiple paths via the cluster fabric to a target fabric-attached I/O device that may be allocated or assigned to different hosts~~via the cluster fabric~~; and

directing service requests between the host and the target fabric-attached I/O controller in response to the multiple paths.

26. (Previously added) The method as claimed in claim 25, wherein the identified fabric-attached I/O devices are reported, via a fabric bus driver included in the operating system (OS) to provide a local I/O bus abstraction for the cluster fabric into the memory, using a common set of procedures or commands.

27. (Previously added) The method as claimed in claim 26, wherein the fabric bus driver is further configured to create a separate device object for each port of the host that can be used to communication with the target fabric-attached I/O device and establish the multiple paths to the target fabric-attached I/O device, via the cluster fabric.

28. (Previously added) The method as claimed in claim 26, wherein the multiple paths are utilized for load balancing I/O requests and/or for fault tolerance when one or more paths to the target fabric-attached I/O device fail.

29. (Previously Amended) A method of initializing a host to report multiple paths ~~to a target I/O device~~ via a cluster fabric to a target I/O device that may be allocated or assigned to different hosts, comprising:

loading a local I/O bus driver and a fabric bus driver providing a local I/O bus abstraction for the cluster fabric into a memory;

identifying, using the local I/O bus driver, local I/O controllers connected to a local I/O bus in the host;

identifying, using the fabric bus driver, fabric-attached I/O devices that may be allocated or assigned to different hosts and that are assigned to the host in order to determine multiple paths to a target fabric-attached I/O device that may be allocated or assigned to different hosts, and report all multiple paths to a the target fabric-attached I/O device via the cluster fabric; and

directing service requests between the host and the target fabric-attached I/O controller in response to the multiple paths.

30. (Previously added) The method as claimed in claim 29, wherein the multiple paths are utilized for load balancing I/O requests and/or for fault tolerance when one or more paths to the target fabric-attached I/O device fail.